

# Forest Products Industries’ Economic Contributions: Connecticut

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## Foreword

With approximately 0.8 billion trees in Connecticut—roughly 225 trees per resident—Connecticut residents are forest dwellers. Trees and forests significantly contribute to our quality of life by providing a variety of ecosystem services, including filtering air, moderating temperatures, sequestering and storing carbon, as well as creating stormwater flows, wildlife habitats, and, more aesthetically, our iconic annual display of fall colors. Connecticut’s trees and forests are some of the most diverse in the nation. Whether in an urban, suburban, or rural setting, trees make Connecticut an attractive place to live, work, and play.

But for every advantage of our trees and forests, there are also challenges. Forest land conversion to commercial or residential use, invasive species, unusual weather patterns, and unprecedented wind events stress the survival of our beloved landscape. Ironically, the survival of our trees and forests depends on a robust forest products industry.

Foresters have a saying: no markets equates to no management. This means that individual tree and woodland owners need forest products markets to maintain vibrant and healthy trees and forests. The inability to respond to challenges results in a disincentive for woodland owners to keep their forests as forests and increases wood waste disposal costs for tree owners.

Connecticut forests’ suite of ecosystem services directly correlates to the health and vibrancy of Connecticut’s forest products industry. Although a small state, Connecticut contributes to and receives forest products from the northeast wood basket, which helps meet the world’s forest products needs with local sustainably harvested trees, offsetting illegal and environmentally damaging forest practices in other less-regulated countries.

Christopher Martin  
Connecticut State Forester

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## Executive Summary

This report assesses broad forest conditions and economic contributions of forest products industries in Connecticut. It is one of 20 coordinated and comparable state reports in the northeastern and midwestern United States that provides an improved assessment of forests and the economies they support. Forest data come from the U.S. Forest Service's Forest Inventory and Analysis website, and economic data come from the 2017 Impact Analysis for Planning (IMPLAN), a commercially available economic input-output (IO) model.

Connecticut boasts 1.8 million acres of forest land that cover 58 percent of its land base, with most of this forest land able to produce commercial timber. The majority, 72 percent, is privately owned, while state and local governments own about 28 percent, and less than half of a percent is in federal ownership.

## Forest Industries

This report presents seven forest products industries, which are based on 32 economic sectors in IMPLAN, 27 of which are present in Connecticut:

- Forestry
- Logging
- Primary solid wood products
- Secondary solid wood products
- Wood furniture
- Pulp, paper, and paperboard mills
- Secondary paperboard and other paper products

In 2017, Connecticut's forest products industries provided direct employment to over 7,700 people, leading to \$2.4 billion in output. That same year, labor income was \$612.3 million and value-added was \$673.0 million. In total contributions, these industries supported over 16,000 jobs, \$1.2 billion in labor income, \$1.6 billion in value-added, and \$4.0 billion in output.

Among the top sectors (excluding forest products sectors) impacted by forest products industries were wholesale trade, real estate, management of companies and enterprises, restaurants, hospitals, and others. This group of sectors reflects spending by forest products companies, their suppliers, and individuals.

## Leading Forest Products Industry Groups

Among the seven industry groups, the leading industries' rank in terms of direct jobs, value-added, and direct output varied by chosen measure:

- Wood furniture had the highest number of direct jobs (2,535), the second highest value-added (\$194.3 million), and the third highest direct output (\$450.9 million).
- Secondary paperboard and other paper products had the second highest number of direct jobs (2,164), the highest value-added (\$216.7 million), and the highest direct output (\$964.1 million).
- Secondary solid wood products had the third highest employment (1,268), and the fourth highest value-added (\$70.8 million), and output (\$230.8 million).
- Pulp, paper, and paperboard mills had the fourth highest number of direct jobs (828), the third highest value-added (\$119.9 million), and the second highest direct output (\$611.0 million).

## Leading Individual Forest Products Sectors

Among the 27 forest products sectors present in Connecticut, the top four, by measure in order from highest to fourth highest of direct contributions, were:

- Employment—Wood kitchen cabinet and countertop manufacturing, paperboard container manufacturing, paper bag and coated and treated paper manufacturing, and paper mills were the top four sectors and had a combined total of over 3,829 direct jobs, or 49.5 percent of direct employment.
- Labor income—Wood kitchen cabinet and countertop manufacturing, paperboard container manufacturing, paper mills, and paper bag and coated and treated paper manufacturing had the highest labor income, totaling \$323.7 million, or 52.9 percent of direct labor income.
- Value-added—Paperboard container manufacturing, paper mills, wood kitchen cabinet and countertop manufacturing, and paper bag and coated and treated paper manufacturing had the highest value-added, totaling \$383.3 million, or 57.0 percent of direct value-added.
- Output—Paperboard container manufacturing, paper mills, paper bag and coated and treated paper manufacturing, and wood kitchen cabinet and countertop manufacturing were the top four sectors in output, totaling \$1.6 billion, or 64.9 percent of total direct output.

## Connecticut's Forest Products Industries Compared to Other Connecticut Industries

The forest products industries provide more direct labor income and output than commercial fishing, hunting, and trapping; mining and oil and gas production; and agricultural production industries (plant crop and animal). Agricultural production provided the most employment. Overall, the forest products industries accounted for 4.6 percent of the nonfood manufacturing jobs in Connecticut and over 4

percent of Connecticut's 166,000 direct manufacturing jobs in 2017 were in the forest products industries (i.e., one in 25 manufacturing jobs).

## **Connecticut's Forest Products Industries Compared to Those of Massachusetts, New York, Vermont, and New Hampshire**

Forest products industries in Connecticut, Massachusetts, New York, Vermont, and New Hampshire employed over 83,200 workers and accounted for \$24.2 billion in direct output. New York's forest products economy was the largest in the region, followed by Massachusetts. Connecticut's forest products economy was the fourth largest in terms of direct jobs and the third largest in output among these states.

# Glossary

The following technical terms are used throughout this report when discussing forestry and economic contributions.

## Forestry Terms

**Average annual harvest removals:** The average annual merchantable volume of growing-stock trees that were live at the time of the previous inventory and were either cut and removed by direct human activity related to harvesting or died as a result of silvicultural or land-clearing activity by the time of the current inventory.

**Average annual mortality:** The average annual merchantable volume of growing-stock trees that were live at the time of the previous inventory and are dead in the current inventory.

**Average annual net growth:** The average annual change in merchantable volume of growing-stock trees, after deducting mortality volume, between inventories.

**Forest land:** Land that is at least 10 percent stocked by trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated. Forest land includes transition zones, such as areas between heavily forested and nonforested lands that have at least 10 percent canopy cover with live tally trees, or recently had at least 10 percent canopy cover by live tally trees based on the presence of stumps, snags or other evidence, and forest areas adjacent to urban and built-up lands, including pinyon-juniper and chaparral areas in the western U.S. and afforested areas. The minimum area for classification of forest land is one acre and 120 feet wide measured stem-to-stem from the outermost edge. Unimproved roads and trails, streams, and clearings in forest areas are classified as forest land if less than 120 feet wide.

**Growing stock:** Live trees of commercial species that meet minimum merchantability standards and only includes trees at least 5 inches in diameter at breast height. In general, these trees have at least one solid eight-foot section, are reasonably free of form defect on the merchantable bole, and at least 34 percent or more of the volume is merchantable. Excludes rough or rotten cull trees.

**Timberland:** A subset of forest land that produces or can produce crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. (Note: Areas qualifying as timberland can produce at least 20 cubic feet per acre per year of industrial wood in natural stands. Currently inaccessible and inoperable areas are included.)

## Economic Contribution Terms

**Direct effects/contributions:** The economic activities (e.g., output, employment, labor income, and value-added) associated with an industry or sector in the study area. These can describe the current economic sectors or changes to those sectors.

**Employment:** The number of full- and part-time jobs associated with an industry.

**Indirect effects/contributions:** The impact of local industries purchasing goods and services from other industries, leading to others' outputs, employment, and labor income. This report uses "indirect effects" to refer to the combination of indirect and induced effects.

**Induced effects/contributions:** The impact of labor income (employee compensation and proprietor income) via goods and services purchased due to the direct and indirect spending by industries. For this report, induced effects are included with indirect effects and referred to as indirect effects.

**Labor income:** The dollar total of employee compensation and proprietor income; the latter is associated with self-employed individuals.

**Output:** The dollar measure of production within an area; it is also viewed as sales.

**Social Accounting Matrix (SAM) multipliers:** These multipliers are derived by dividing the sum of direct, indirect, and induced effects by the direct effects. The social accounts include payments made between households, households and government, and more. These are available for output, employment, labor income, and value-added and are used to assess effects of changes in industry activity (i.e., "ripple effects").

**Total effects/contributions:** The sum of direct, indirect, and induced effects.

**Value-added** (also known as gross state product, or GSP): The sum of labor income, other property income (e.g., rents and profits), and indirect business taxes (e.g., excise and sales taxes). It is the difference between an industry's total output and the cost of its intermediate inputs. The sum of value-added for all economic sectors within the region equals the total GSP.

## Introduction

Forest products industries are an integral component of Connecticut's economy. They provide jobs, raw materials, and finished goods that generate additional economic activity throughout the state, region, and nation. Previous studies of the industries' economic contributions have focused solely on examining the role the industries play in Connecticut's economy. Until now, no attempt has been made to compare the contributions of Connecticut's forest products industries with those of nearby states, nor to examine the interaction of those industries at the regional or national level. In part, this is due to a lack of a consistent reporting format across the northeast and northcentral area, which may be partly attributable to different states using different methods and data.

This report compares the contributions of Connecticut's forest products industries with those of adjacent states. It is one of 20 reports in the Northeast and Midwestern area of the United States that broadly assesses forests and their economic contributions. The interactions of these 20 states are covered in a regional report. In total, these documents provide a consistent reporting format, compiled using identical methods, across the northeastern and midwestern United States. Previous state-level reports in this area were not comparable because they used different methods and data.

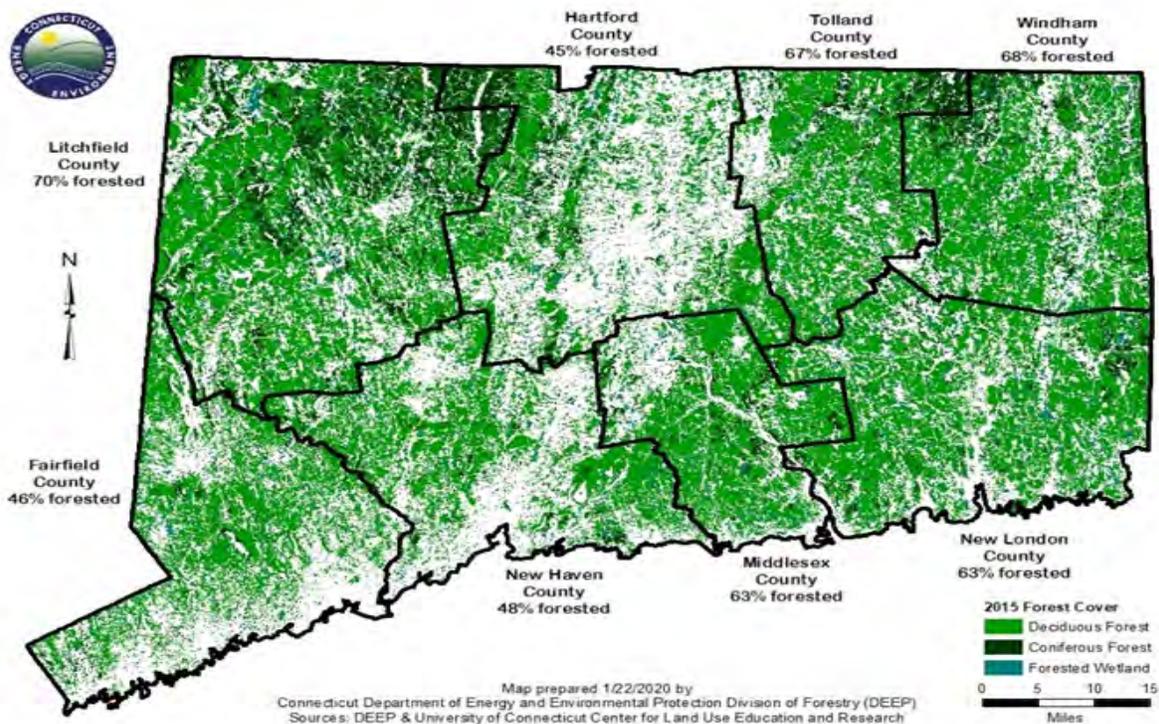
To help quantify these relationships and consistently document the industries' contributions, the Forest Markets & Utilization Committee of the Northeast—Midwest State Foresters Alliance secured federal grant funds to conduct an analysis of 20 midwestern- and northeastern—area states as well as Nebraska. As part of this work, the same project team that completed the individual state reports—comprising members of the Michigan Department of Natural Resources, Public Sector Consultants, Michigan State University forestry economics professor emeritus Larry Leefers, and state forestry experts—published a 20-state report summarizing the economic contributions of forest products industries at a regional level. The U.S. Forest Service funded this work through a 2017 Landscape Scale Restoration grant.

Much of the data used in this report were derived from the U.S. Forest Service Forest Inventory and Analysis database and from IMPLAN, a widely used economic modeling system. These data and related information are presented in four major sections: Forest Resources of Connecticut, Forest Products Industries, Economic Contributions of Connecticut's Forest Products Industries, and Summary. Due to rounding, some figures in the following tables may not sum to the exact total indicated. The appendices present the economic methods and detailed economic sector data used for this report.

## Forest Resources of Connecticut

Connecticut is rich in forest resources, as highlighted in Exhibit 1, which shows the percent of forest land by county throughout the state. Experiencing an estimated low of approximately 25 percent forest land in the early 1800s (Harper 1918), it has rebounded and remained at a relatively stable amount of area since the 1950s, when statistics were first gathered (Butler et al. 2015).

**Exhibit 1.** Connecticut’s Forest Land by County, 2017



Approximately 58 percent of the state is forested (Exhibit 2). The majority of Connecticut’s forest land is privately owned (71.9 percent). Over one quarter (27.7 percent) is owned by state and local governments, while the remainder is in federal ownership (Exhibit 3). Landowners pursue diverse goals. Private landowners have wide latitude in how they treat their lands—some have a hands-off approach, while others pursue active management. There are several state and federal programs designed to encourage the active management of private forest lands. State forests are actively managed in many areas, while resource protection is emphasized in others. Active timber management provides the feedstock for Connecticut’s forest products industries.

Trees are common throughout the state. They are in our forests, along our rivers, in our cities, and in our yards. “On the forest land in Connecticut, there are an estimated 0.8 billion live trees” (Butler, Brett J. 2018). This is equivalent to approximately 225 trees for each person in the state when utilizing 2019 U.S. Census Bureau populations estimates for Connecticut.

**Exhibit 2.** Connecticut Land Area by Land Use Type, 2017 (U.S. Forest Service)

Land Use Type	Acres	Percentage
Forest land	1,790,099	58.1%
Nonforest land	1,289,070	41.9%
<b>Total</b>	<b>3,079,169</b>	<b>100.0%</b>

**Exhibit 3.** Forest Land by Ownership Group, in Acres (2017)

Ownership Group	Acres	Percentage
Private	1,286,230	71.9%
State and local governments	496,047	27.7%
Other Federal	7,822	0.4%
<b>Total</b>	<b>1,790,099</b>	<b>100.0%</b>

Connecticut’s major forest types include oak/hickory, elm/ash/cottonwood, northern hardwoods (maple/beechn/birch), and oak/pine (Exhibit 4). Tree species with the greatest standing volume include red maple, northern red oak, black oak, eastern white pine, black birch, and white oak. Connecticut’s diverse timber species support a variety of forest products industries. Due to its high quality and proximity to ports, trucking, and rail, a large portion of the timber harvested in Connecticut is exported to Canada and overseas, while a host of niche markets exist within the state. Markets include grade lumber, post and beam framing, treated railroad ties, naval timbers, custom pallets and blocking, cabin logs, and a variety of industrial lumber and wood packaging products. Connecticut is also home to the world’s largest witch hazel distillery, American Distilling, which converts a forest plant into a botanical ingredient used in medical, pharmaceutical, and personal care products. (The economic contribution of this facility is not included as it is not within the 27 sectors used in this report).

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**Exhibit 1. Forest Land Area by Forest Type Group (2017)**

Forest Type Group	Acres	Percentage
Oak/hickory	1,251,650	69.9%
Elm/ash/cottonwood	139,375	7.8%
Maple/beech/birch	86,894	4.9%
Other hardwoods	86,113	4.8%
Oak/pine	80,130	4.5%
Other	145,936	8.1%
<b>Total</b>	<b>1,790,099</b>	<b>100.0%</b>

The estimated volume of standing timber suitable for forest products was about 4.3 billion cubic feet (Exhibit 5). Average annual net growth exceeded annual harvest removals by a ratio of over 6.3 to 1, allotting for significant contributions to carbon storage and sequestration even after removals. That is, for every cubic foot of harvesting that takes place, more than 6 cubic feet of timber grows after accounting for mortality. Average annual harvest removals of growing stock were about 14.6 million cubic feet—roughly 0.3 percent of standing volume.

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**Exhibit 2. Characteristics of Growing Stock in Connecticut, 2017 (million cubic feet)**

Measure	Total	Other Federal	State and Local Government	Private
Net volume	4,277.3	21.6	1,206.1	3,049.5
Average annual net growth	92.4	(0.4)	24.4	68.3
Average annual harvest removals	14.6	-	5.5	9.1
Average annual mortality	21.4	.7	5.4	15.3

Note: Net volume is merchantable volume, in cubic feet, of growing-stock trees for timber species (trees where diameter is measured at breast height) from a 1-foot stump to a minimum 4-inch top diameter, or to where the central stem breaks into limbs all of which are less than 4.0 inches in diameter. Volume loss due to rotten, missing, and form cull has been deducted. Growing stock is defined as live trees of commercial species that meet minimum merchantability standards and only includes trees at least 5 inches in diameter at breast height. Net growth is the average annual change (gross growth minus mortality) in merchantable volume, in cubic feet, of growing-stock trees on forestland. Harvest removals are the average annual merchantable volume, in cubic feet, of growing-stock trees at the time of removal from forest land. Annual mortality is the average annual merchantable volume, in cubic feet, of growing-stock trees at the time of mortality on forest land.

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## Forest Products Industries

Contribution analysis focuses on industries' role in an economy. The first step is often defining the region (e.g., a state). One of the next steps is to define exactly which economic sectors comprise the

focus industries. To analyze the contributions of the forest industries, representatives from the U.S. Forest Service’s northeastern and midwestern states and Nebraska selected 32 sectors by consensus for inclusion in the analysis. A description of the methods and data is presented in Appendix A. To concisely describe and communicate the economic contribution of the forest products industries, these 32 sectors were aggregated into seven broad groups (Appendix B):

- Forestry
- Logging
- Primary solid wood products
- Secondary solid wood products
- Wood furniture
- Pulp, paper, and paperboard mills
- Secondary paperboard and other paper products

In total, these sectors cover forest-specific manufacturing activities, including the conversion of trees into primary products and the manufacture of products used by other sectors and households. Primary industries (e.g., sawmills, reconstituted wood products [such as oriented strand board], and power plants) use wood directly from the forest, including roundwood, chips, or similar forms. Secondary industries (e.g., trusses and furniture) use one or more primary forest products (e.g., lumber and paperboard) in their manufacturing processes. Value is added as the timber is processed through primary and secondary manufacturers. Several sectors included wood and nonwood products (e.g., institutional furniture manufacturing). Therefore, output and other measures were reduced to better reflect the wood-only component by using published government data or surveys (Gibson, Leefers, and Poudel 2020).

This report used IMPLAN to estimate economic contributions of the forest products industries. IMPLAN is a widely used input-output model that comprises economic data and software. IO models characterize financial linkages among and between sectors, households, and institutions. Within these models, various sectors have production functions that show the value of inputs used in production of outputs or commodities. Connecticut’s economy was represented by 461 sectors in 2017, the most recent year available for IMPLAN data at the time of the analysis. These sectors are based on the North American Industrial Classification System (NAICS).

IMPLAN models can be constructed for different geographic areas. State data were used in this report, but given IMPLAN’s structure, substate and multistate analyses can be developed.

# Economic Contributions of Connecticut’s Forest Products Industries

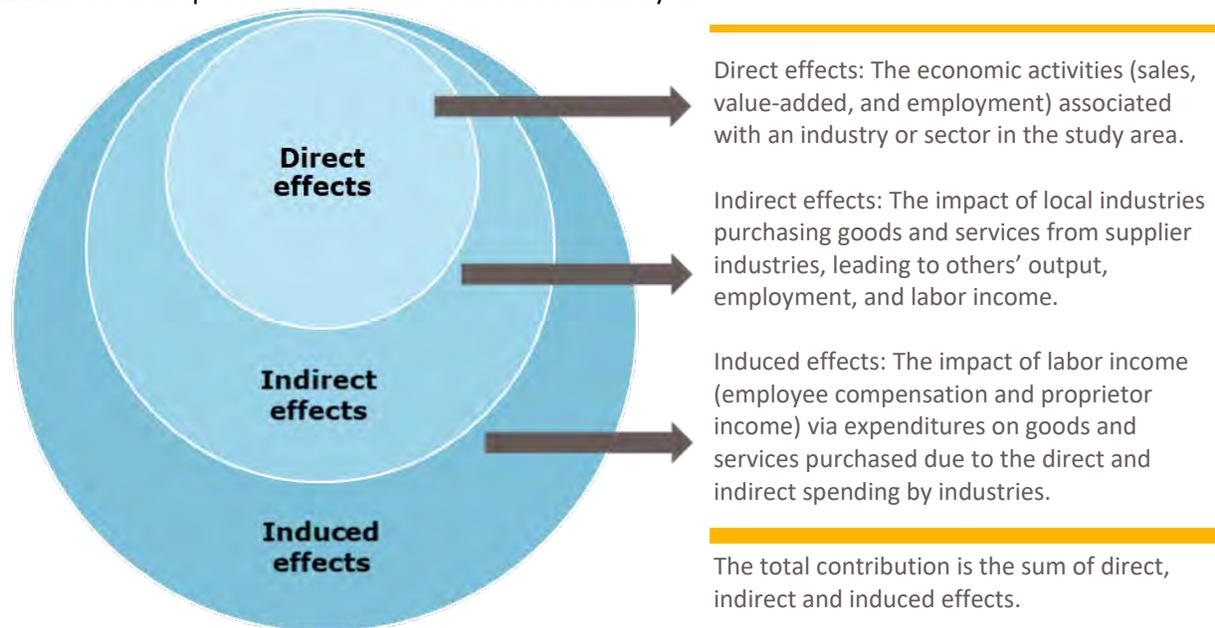
This section of the report includes four major subsections: Economic Contributions Defined, Economic Contribution Results, Importance of the Forest Products Industries in Context, and Supplemental Economic Contribution Information.

## Economic Contributions Defined

### Input-Output Analysis and IMPLAN

Forest products industries influence the economy in three ways: direct effects (when industries sell commodities in response to demand), indirect effects (as suppliers to directly impacted sectors), and induced effects (household spending by employees in directly and indirectly impacted sectors) (Exhibit 6). The total economic contribution is the value of production required to meet all the needs stemming from the initial activity—in this case, forest product–related purchases.

**Exhibit 3.** Concept of Total Economic Contribution Analysis



IO modeling using IMPLAN software and data is a conventional approach for documenting forest products industries’ economic contributions. This analysis used the matrix inversion approach with external IMPLAN model adjustment as a primary method for estimating economic contributions of forest products industries in Connecticut (Gibson, Leefers, and Poudel 2020). Major economic indicators generated by IMPLAN include employment (full- and part-time jobs), labor income, total output, and value-added.

## **Interaction Between State and Regional Analyses**

IMPLAN models are based on interactions across the economy. One important aspect of these interactions is whether commodities are sourced locally or imported. In smaller areas (e.g., counties), fewer commodities are sourced locally. As a result, leakages occur when purchases are made—that is, fewer dollars stay in the local economy.

Larger economies have fewer leakages and more commodities are sourced locally. For example, an examination of the logging industries (IMPLAN sector 16) in Connecticut and Massachusetts, reveals that the direct employment for 2017 was 569 and 835 jobs, respectively. Summing the individual state's total employment contributions (direct, indirect, and induced) yields 2,299 jobs. However, if the states are combined as one region, the total employment contribution increases to 2,338 jobs. This increase reflects less leakage and more local purchases.

The larger role is due to trade, but IMPLAN does not explicitly show trade with specific states, only overall imports and exports. The regional analysis highlights the larger role of forest products industries in the region's economy. Consequently, the state-level analyses underestimate the actual contributions from a regional perspective.

## **Economic Contribution Results**

This section presents direct and total contributions for all forest products industries, direct and total contributions by forest product industry groups (e.g., logging, furniture, etc.), the top forest products sectors, and the top nonforest products sectors affected by the forest products industries. Finally, this section compares forest industries in nearby states, other natural resources industries, and manufacturing industries within the state.

### **Direct and Total Contributions by Forest Products Industries**

Contribution analysis provides a means to assess the role various industries play in a state's economy. Connecticut forest products industries' total economic contribution in terms of output was \$4.0 billion, based on direct output of \$2.4 billion (Exhibit 7). About 7,700 direct jobs were associated with this level of economic activity, and the total number of jobs supported was 16,141. Direct labor income, which includes employee compensation and proprietor income, was \$612.3 million, or about \$79,213 per job. Total labor income, which includes income paid directly to industry employees and proprietors, their suppliers, and other industries they support, totaled \$1.2 billion.

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**Exhibit 4. Region-wide Economic Contribution of Forest Products Industries, 2017 Dollars**

<b>Effect</b>	<b>Employment</b>	<b>Labor Income (Thousands of Dollars)</b>	<b>Value-added* (Thousands of Dollars)</b>	<b>Output (Thousands of Dollars)</b>
Direct	7,730	\$612,313	\$673,015	\$2,415,490
<b>Total</b>	<b>16,141</b>	<b>\$1,224,699</b>	<b>\$1,637,604</b>	<b>\$3,957,671</b>

\* Value-added in IMPLAN is equivalent to GSP.

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Each direct job in the forest products industries supported 1.09 additional jobs, and every \$1 million in direct labor income supported an additional \$1.0 million in indirect and induced labor income.

Most state economies are large relative to any particular industry or group of industries. The forest products industries are no exception. In 2017, Connecticut's population was estimated at 3.6 million people, with total employment of 2.3 million. The gross state product was \$267.2 billion from 461 economic sectors (of the possible 536 in the US). The GSP's largest component was labor income, which was \$171.5 billion.

Direct value-added for forest products industries was \$673.0 million; 0.3 percent of Connecticut's total GSP. The percentage doubles to 0.6 percent when considering total value-added effects. These percentages hold for other economic measures (e.g., jobs) as well.

### **Direct and Total Contributions by Forest Product Industry Groups**

As previously noted, the 32 IMPLAN forest products sectors were combined into seven industry groups (Appendix B). In Connecticut, wood furniture was the largest of these groups in terms of direct employment and labor income, second largest in value-added, and third largest in terms of output. Secondary paperboard and other paper products was the second largest group in terms of direct employment and labor income, and the largest in value-added and output. Forestry, which includes maple syrup production, timber tract operations, and forestry support activities, was the smallest group for all metrics.

Two groups—pulp, paper, and paperboard mills and secondary paperboard and other paper products—accounted for nearly two-thirds of the output of forest products industries. Over 60 percent of forest products industries employment was in the wood furniture and secondary paperboard and other paper products groups.

**Exhibit 5.** Direct Economic Contributions in Connecticut, Industry Groups, 2017

<b>Industry Group</b>	<b>Employment</b>	<b>Labor Income (Thousands of Dollars)</b>	<b>Value-added (Thousands of Dollars)</b>	<b>Output (Thousands of Dollars)</b>
Forestry	90	\$1,683	\$1,642	\$2,506
Logging	569	\$25,807	\$27,016	\$39,521
Primary solid wood products	276	\$37,889	\$42,710	\$116,580
Secondary solid wood products	1,268	\$74,468	\$70,756	\$230,835
Wood furniture	2,535	\$209,721	\$194,252	\$450,940
Pulp, paper, and paperboard mills	828	\$86,036	\$119,908	\$611,003
Secondary paperboard and other paper products	2,164	\$176,709	\$216,730	\$964,105
<b>Total</b>	<b>7,730</b>	<b>\$612,313</b>	<b>\$673,015</b>	<b>\$2,415,490</b>

**Exhibit 6.** Total Economic Contributions in Connecticut, Industry Groups, 2017

<b>Industry Group*</b>	<b>Employment</b>	<b>Labor Income (Thousands of Dollars)</b>	<b>Value-added (Thousands of Dollars)</b>	<b>Output (Thousands of Dollars)</b>
Forestry	64	\$960	\$1,176	\$2,136
Logging	278	\$13,343	\$16,156	\$24,085
Primary solid wood products	859	\$74,253	\$99,062	\$197,897
Secondary solid wood products	2,257	\$143,030	\$178,505	\$401,791
Wood furniture	4,480	\$340,479	\$400,878	\$781,487
Pulp, paper, and paperboard mills	3,130	\$260,081	\$388,544	\$1,041,880
Secondary paperboard and other paper products	5,074	\$392,553	\$553,282	\$1,508,395
<b>Total</b>	<b>16,141</b>	<b>\$1,224,699</b>	<b>\$1,637,604</b>	<b>\$3,957,671</b>

\*Forestry and logging are reported in this table, but most of their contributions are as indirect inputs or intermediate inputs used for production in the other five industry groups.

For the following sector-specific discussions, refer to Exhibit 8 for direct contribution details and Exhibit 9 for total contribution details. See Appendix C for detailed economic measures for industry groups and their component sectors.

## **Forestry**

The forestry group includes timber tract operations, establishments primarily engaged in the operation of timber tracts for the purpose of selling standing timber, and support activities for forestry such as estimating timber; forest firefighting; forest pest control; treating burned forests from the air for reforestation or on an emergency basis; and consulting on wood attributes and reforestation related to timber production, wood technology, forestry economics and marketing, and forest protection.

Out of seven industry groups, forestry was the smallest in terms of direct contributions in 2017. Direct contributions were \$2.5 million in output, 90 jobs, \$1.7 million in labor income, and \$1.6 million value-added. In most cases, value-added is greater than labor income, one of the value-added components. Often, this situation does not hold for agricultural sectors due to farm subsidies, which appear as negative taxes. Sector 19, support activities for agriculture and forestry, reflects this for Connecticut in 2017 leading to the smaller value-added. Total contributions are based, in part, on backward linkages to suppliers. Total contributions for forestry can be lower than direct contributions (i.e., initial IMPLAN levels) because many of the contributions are inputs into other industries. For example, over one-third (37 percent) of forestry jobs are counted as contributions in other industries, mostly logging and primary solid wood products (e.g., sawmills). Hence, the total contributions displayed in Exhibit 9 underrepresent the industry's broader contributions—reporting total contributions for forestry is somewhat misleading because much of the forestry total contribution effects are hidden in the total contributions of other industries. The same holds true for logging below.

## **Logging**

The logging industry group contains establishments primarily engaged in one or more of the following: cutting timber, cutting and transporting timber, and producing wood chips in the field. Logging was the third smallest in terms of direct employment. The direct contributions of logging were \$39.5 million in output, 569 jobs, \$25.8 million in labor income, and \$27.0 million in value-added. Most logging activity is an input into production in other industries, especially for manufacturing primary solid wood products (e.g., lumber), paper, and paperboard. In Connecticut, 63 percent of logging jobs are included in the total contributions of other industries. As with forestry, logging's total contributions are underrepresented due to their inclusion in other industries.

## **Primary Solid Wood Products**

The primary solid wood products industry group was the sixth largest group in terms of direct employment in Connecticut. Primary solid wood products sectors include wood-based electric power generation, sawmills, wood preservation, veneer and plywood manufacturing, and reconstituted and wood product manufacturing industries. The direct contributions of the group were \$116.6 million in output, 276 jobs, \$37.9 million in labor income, and \$42.7 million in value-added. Total contributions for primary solid wood products, including direct, indirect and induced effects, were \$197.9 million in output, 859 jobs, \$74.3 million in labor income, and \$99.1 million in value-added. Many primary solid

wood products (e.g., lumber and panels) are inputs in other industries; those inputs are counted in other industries' total contributions.

### **Secondary Solid Wood Products**

Secondary solid wood products was the third largest group in terms of direct employment in Connecticut. This group contains engineered wood member and truss manufacturing; wood windows and doors manufacturing; cut stock, resawing lumber, and planing; other millwork, including flooring, wood container, and pallet manufacturing; manufactured home (mobile home) manufacturing; prefabricated wood building manufacturing; and all other miscellaneous wood product manufacturing. Direct contributions of secondary solid wood products were \$230.8 million in output, 1,268 jobs, \$74.5 million in labor income, and \$70.8 million in value-added. Total contributions were \$401.8 million in output, 2,257 jobs, \$143.0 million in labor income, and \$178.5 million in value-added.

### **Wood Furniture**

Wood furniture was the largest group in terms of direct employment in Connecticut. Wood furniture includes wood kitchen cabinet and countertop manufacturing; upholstered household furniture manufacturing; nonupholstered wood household furniture manufacturing; institutional wood furniture manufacturing; wood office furniture manufacturing; custom architectural woodwork and millwork manufacturing; and showcase, partition, shelving, and locker manufacturing. Direct contributions of wood furniture were \$450.9 million in output, 2,535 jobs, \$209.7 million in labor income, and \$194.3 million in value-added. Total contributions of wood furniture were \$781.5 million in output, 4,480 jobs, \$340.5 million in labor income, and \$400.9 million in value-added.

### **Pulp, Paper, and Paperboard Mills**

The pulp, paper, and paperboard mills industry group was the fourth largest in terms of direct employment in Connecticut. The group includes pulp mills, paper mills, and paperboard mills that make paper or pulp from raw wood and from purchased pulp. The pulp, paper, and paperboard mills group's direct contributions were \$611.0 million in output, 828 jobs, \$86.0 million in labor income, and \$119.9 million in value-added. Total contributions were \$1.0 billion in output, 3,130 jobs, \$260.1 million in labor income, and \$388.5 million in value-added.

### **Secondary Paperboard and Other Paper Products**

The secondary paperboard and other paper products group was the second largest in terms of direct employment in Connecticut. The group comprises paper and paperboard manufacturing, paper bag and coated and treated paper manufacturing, stationery product manufacturing, sanitary paper product manufacturing, and all other converted paper product manufacturing. Facilities in this group manufacture products from purchased pulp, paper, paperboard, or recycled materials. The direct contributions in 2017 were \$964.1 million in output, 2,164 jobs, \$176.7 million in labor income, and

\$216.7 million in value-added. Total contributions were \$1.5 billion in output, 5,074 jobs, \$392.6 million in labor income, and \$553.3 million value-added.

### **Top Forest Product Sectors**

Among the 32 industry sectors that comprise the seven industry groups listed above, the leading sectors varied by the contribution measure examined. In terms of direct jobs, the four largest forest products sectors are wood kitchen cabinet and countertop manufacturing (1,215 jobs), paperboard container manufacturing (1,179 jobs), paper bag and coated and treated paper manufacturing (751 jobs), and paper mills (685 jobs). These sectors reflect the diversity of manufacturing in the state.

The wood kitchen cabinet and countertop manufacturing sector has establishments primarily engaged primarily engaged in manufacturing wood or plastics laminated on wood kitchen cabinets, bathroom vanities, and countertops (except freestanding). The cabinets and counters may be made on a stock or custom basis.

The paperboard container manufacturing sector comprises establishments primarily engaged in converting paperboard into containers without manufacturing paperboard. These establishments use corrugating, cutting, and shaping machinery to form paperboard into containers. Products made by these establishments include boxes, corrugated sheets, pads, pallets, paper dishes, fiber drums, and reels. In a consumer-driven economy with more and more shipping, this industry is well positioned for growth.

The paper bag and coated and treated paper manufacturing sector comprises establishments primarily engaged in one or more of the following: cutting and coating paper and paperboard; cutting and laminating paper, paperboard, and other flexible materials (except plastics film to plastics film); manufacturing bags, multiwall bags, sacks of paper, metal foil, coated paper, laminates, or coated combinations of paper and foil with plastics film; manufacturing laminated aluminum and other converted metal foils from purchased foils; and surface coating paper or paperboard.

The paper mills industry comprises establishments primarily engaged in manufacturing paper (except newsprint and uncoated groundwood paper) from pulp. These establishments may manufacture or purchase pulp. In addition, the establishments may also convert the paper they make.

In terms of labor income, wood kitchen cabinet and countertop manufacturing, paperboard container manufacturing, paper mills, and paper bag and coated and treated paper manufacturing were the highest, totaling \$323.7 million. They also had the highest value-added and output—totaling \$383.3 million and \$1.6 billion respectively.

### **Top Nonforest Industries Impacted**

Contribution analysis using IMPLAN relies on backward linkages from forest products industries sectors among themselves and to other sectors in Connecticut. Including the 27 forest products industries

present in Connecticut, 135 sectors were impacted in 2017 (counting sectors with ten or more jobs supported). The top ten sectors (excluding forest products sectors) included wholesale trade, real estate, management of companies and enterprises, restaurants, hospitals, and others (Exhibit 10). This set of sectors reflects indirect and induced spending by forest products companies, their suppliers, and individuals.

These data were at an aggregate level, so the 144 jobs in truck transportation included log trucks, delivery trucks, and office jobs for some trucking companies, among others. Five of these sectors were among the top ten sectors in the state of Connecticut (real estate was number one, with over 113,000 jobs and wholesale trade was number three with over 74,000 jobs).

**Exhibit 7.** Direct Jobs Impacted by the Forest Products Industries Among Connecticut’s Top Ten Non-Forest Products Industries in 2017

<b>IMPLAN Sector</b>	<b>Description</b>	<b>Jobs</b>
395	Wholesale trade	695
440	Real estate	381
461	Management of companies and enterprises	354
501	Full-service restaurants	322
502	Limited-service restaurants	240
482	Hospitals	236
468	Services to buildings	234
485	Individual and family services	147
464	Employment services	147
411	Truck transportation	144
<b>Total</b>	<b>NA</b>	<b>2,900</b>

### Neighboring States

Connecticut, Massachusetts, New York, Vermont, and New Hampshire are part of an important region for forest products. Forest products industries employ over 83,200 workers across the region and account for \$24.2 billion in direct output (Exhibits 11 and 12). New York had the largest forest products economy with 43,024 direct jobs and output in excess of \$13.4 billion, followed by Massachusetts. Connecticut’s industry was the fourth smallest in terms of direct employment and the third largest in terms of direct output. The two largest industry groups, each with about 20,000 employees, were wood furniture and secondary paperboard and other paper products.

**Exhibit 11.** Forest Products Industries Direct Employment in Connecticut, Massachusetts, New York, Vermont, and New Hampshire, 2017

Industry	Connecticut	Massachusetts	New York	Vermont	New Hampshire
Forestry	90	1,030	1,658	3,342	1,250
Logging	569	835	4,013	1,737	1,732
Primary solid wood products	276	300	2,861	941	1,107
Secondary solid wood products	1,268	2,790	7,113	1,053	1,170
Wood furniture	2,535	3,195	11,791	1,318	1,181
Pulp, paper, and paperboard mills	828	1,845	4,898	641	389
Secondary paperboard and other paper products	2,164	6,087	10,689	76	460
<b>Sum of direct contributions</b>	<b>7,730</b>	<b>16,083</b>	<b>43,024</b>	<b>9,107</b>	<b>7,289</b>

**Exhibit 12.** Forest Products Industries Direct Output in Connecticut, Massachusetts, New York, Vermont, and New Hampshire, 2017

Industry	Connecticut (Thousands of Dollars)	Massachusetts (Thousands of Dollars)	New York (Thousands of Dollars)	Vermont (Thousands of Dollars)	New Hampshire (Thousands of Dollars)
Forestry	\$2,506	\$58,990	\$48,511	\$75,732	\$35,685
Logging	\$39,521	\$126,321	\$265,205	\$90,979	\$265,556
Primary solid wood products	\$116,580	\$104,095	\$895,177	\$305,966	\$441,289
Secondary solid wood products	\$230,835	\$533,076	\$1,346,545	\$217,960	\$229,118
Wood furniture	\$450,940	\$546,528	\$1,956,501	\$173,733	\$170,622
Pulp, paper, and paperboard mills	\$611,003	\$1,247,694	\$3,620,763	\$474,397	\$287,943
Secondary paperboard and other paper products	\$964,105	\$2,738,083	\$5,351,321	\$32,082	\$190,198
<b>Sum of direct contributions</b>	<b>\$2,415,490</b>	<b>\$5,354,786</b>	<b>\$13,484,023</b>	<b>\$1,370,850</b>	<b>\$1,620,412</b>

## Importance of the Forest Products Industries in Context

The forest products industry in Connecticut provides employment to citizens in rural and suburban areas that ranges from harvesting raw materials in the field to corporate headquarter staffing.

The majority of the harvesting community is dominated by small crews or operations, with only a handful of companies employing more than a dozen individuals. Mechanized crews are beginning to become the norm, though hand cutting still remains largely viable. Connecticut's forest products industry primarily deals in sawlogs (the majority of which are shipped to Canada or overseas), as well as railroad ties and pallet lumber. Rail transportation of materials remains low, providing numerous opportunities for trucking, which accounts for the majority of material transport.

Connecticut's energy sector contains a single biomass energy facility (not fueled solely by silvicultural products), numerous biomass-to-heat facilities, wood pellet and bio-brick manufacturers, and mulch producers—all of which provide opportunities for disposal and utilization of storm damaged, oversized, and poor formed trees, as well as a market for the aftermath of catastrophic mortality as the result of insects and disease outbreaks.

Of special note is a facility which both cuts and treats railroad ties in-house at the sawmill itself. A smaller portion of the market consists of chip, pulp, and pellet markets, although regionalization changes have created a demand that is great enough to encourage multistate trade. The remainder of low-grade products make their way into local markets by way of playground mulch, bark mulch, sawdust for agricultural use, and other specialty agricultural related products such as stakes and fencing. Previously headquartered in Stamford, International Paper currently maintains three facilities within the state.

Due to the variability of industries, specialty niche markets such as naval timbers, custom canoe building, Major League Baseball bat production, and the aforementioned witch hazel distillery provide a plethora of market opportunities and attract customers from the entire country and overseas.

To help contextualize the relative importance of the forest products industries, it is useful to compare the contribution of Connecticut's forest products industries with others. Natural resources and agricultural industries significantly contribute to the diversity of economic activities reflected in Connecticut's \$267.2 billion GSP (Exhibit 13). The forest products industries provide more direct labor income and output than commercial fishing, hunting, and trapping; mining and oil and gas production; and agricultural production industries. Connecticut's forest products industries comprised 0.3 percent of the GSP in 2017. Agricultural production provided the largest amount of employment (full- and part-time) of these industries.

**Exhibit 13.** Natural Resources and Agricultural Production Industries in Connecticut, 2017

<b>Industry</b>	<b>Employment</b>	<b>Labor Income (Thousands of Dollars)</b>	<b>Value-added (Thousands of Dollars)</b>	<b>Output (Thousands of Dollars)</b>
Forest products	7,730	\$612,313	\$673,015	\$2,415,490
Commercial fishing, hunting, and trapping	389	\$19,521	\$43,721	\$44,292
Mining and oil and gas production	3,311	\$286,909	\$706,607	\$989,300
Agricultural production (plant crop and animal)	12,079	\$289,578	\$325,589	\$742,682
<b>Total</b>	<b>23,509</b>	<b>\$1,208,322</b>	<b>\$1,748,932</b>	<b>\$4,191,764</b>

Labor income per job is highest in mining and oil and gas production (\$86,653) and lowest in agriculture production (\$23,974). For forest products, the average per job is \$79,213; commercial fishing, hunting, and trapping has the third highest average income at \$50,156.

Most of the forest products industries are manufacturers, however the forestry, logging, and biomass power groups are not. There were over 166,300 manufacturing jobs in Connecticut in 2017, of which 4.2 percent (7,043) were in the forest products industries. Of 16 industries, forest products manufacturing was ninth in terms of employment behind transportation equipment, fabricated metal, machinery, food, miscellaneous, computer and electronic product, electrical equipment, and chemical manufacturing. It was eighth in terms of labor income, eleventh in terms of value-added, and ninth in terms of output (Exhibit 14).

**Exhibit 14. Manufacturing Industries in Connecticut, 2017**

<b>Manufacturing Industries</b>	<b>Employment</b>	<b>Labor Income (Thousands of Dollars)</b>	<b>Value-added (Thousands of Dollars)</b>	<b>Output (Thousands of Dollars)</b>
Transportation equipment	43,422	\$5,662,385	\$6,988,641	\$23,100,598
Fabricated metal	30,685	\$2,678,701	\$4,049,973	\$8,416,145
Machinery	13,587	\$1,519,631	\$1,763,976	\$4,468,317
Food	11,508	\$595,727	\$1,048,679	\$3,826,828
Miscellaneous	10,207	\$771,267	\$1,997,061	\$4,145,075
Computer and electronic product	10,191	\$922,946	\$1,702,442	\$4,018,035
Electrical equipment	8,188	\$136,384	\$1,239,519	\$3,501,180
Chemical	7,657	\$4,913,856	\$5,346,148	\$9,591,357
Forest products	7,043	\$560,613	\$613,290	\$2,330,839
Printing	6,454	\$424,393	\$489,521	\$1,062,924
Plastics and rubber products	5,914	\$436,424	\$636,289	\$1,946,655
Primary metal	3,781	\$371,925	\$423,805	\$2,165,178
Textiles and Apparel	2,748	\$248,044	\$299,776	\$652,258
Nonmetallic mineral product	2,517	\$189,698	\$253,081	\$674,986
Beverage and tobacco product	2,111	\$133,686	\$620,229	\$1,655,570
Petroleum and coal	386	\$131,792	\$274,771	\$699,044
<b>Total</b>	<b>166,396</b>	<b>\$19,697,472</b>	<b>\$27,747,200</b>	<b>\$72,254,989</b>

## Supplemental Economic Contribution Information

The report by Gibson, Leefers, and Poudel provides a detailed discussion of which sectors were included and excluded from this analysis (2020). Most economic data used in this report were derived from IMPLAN. Two exceptions are notable.

First, for most of the partial sectors (Appendix B), ratios of published government data were used to identify a portion of the industry that would be treated as forest products. In cases where only part of an IMPLAN sector was associated with forest products, analysts faced three options. The most conservative option was to include only sectors viewed as 100 percent in forest products, excluding sectors where only part produced forest products. At the other end of the spectrum, analysts could have focused on sectors producing any forest products at all, even if the forest products represented a small part of total output. Between these extremes, analysts could choose a third option—selecting the portion of a sector that produced forest products and include only that portion, mindful to include a means for assessing the magnitude of that portion. That is the approach used in this report.

Second, for sector 47, electric power generation–biomass, the IMPLAN employment figures appeared high based on prior knowledge of this sector. As a result, six facilities were surveyed to assess their 2017 employment. The updated direct employment figure (decreased from 115 to 28) was used in IMPLAN analysis; other sector metrics were increased proportionally.

Wood is used in many other products not covered by the 27 sectors highlighted in this report. For example, boats, blinds, musical instruments, burial caskets, organic chemicals, and pharmaceuticals may use wood directly or as an extract. However, the wood-only component of these product groups is difficult to quantify and was unable to be included in this report. Surveys could be designed and conducted to determine the forest products component of these sectors. In practice, the production functions, employment, output, and other metrics would need to be compiled and inserted into IMPLAN.

## Summary

Over the last 20 years, individual states located in the midwestern and northeastern area of the United States have conducted statewide economic contributions studies of the forest products industries. However, these studies differed in approach, data used, and measures reported. Developing a consistent approach required funding that spanned multiple states. The Forest Markets & Utilization Committee of the Northeast—Midwest State Foresters Alliance secured grant funds through the Landscape Scale Restoration Program within the U.S. Forest Service, Eastern Region, State and Private Forestry to support investigation of the economic contributions of the forest products industry in the 20 northeastern and midwestern states and Nebraska. To that end, the Michigan Department of Natural Resources Forest Resources Division (serving as the lead on the grant project) contracted with Public Sector Consultants to facilitate discussions among the project partner states and to reach consensus on an appropriate analysis methodology and report template for both the regional and state reports, in addition to conducting the analysis.

This report serves as a snapshot of economic contributions of the forest products industries in Connecticut for 2017, as well as a baseline report for future analyses. State data were used in this report, but given IMPLAN's structure, substate and multistate analyses can be developed. However, future analyses may again require funding from the U.S. Forest Service or other institutions for assessments across multiple states. Methods used in developing this report are consistent across the region. There were 7,730 direct jobs in the forest products industries, and overall, 16,141 jobs were supported. Direct labor income was \$612.3 million with total labor income at \$1.2 billion. Direct value-added was \$673.0 million, and the total contribution for value-added was \$1.6 billion. Finally, direct output was \$2.4 billion with a total contribution of \$4.0 billion in output. Similar report findings are available from other states in the region and are summarized in a regional report.

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## Appendix A: Methods and Data

### Input-Output Analysis: IMPLAN

Several key decisions related to methods were developed through a consensus process (Gibson, Leefers, and Poudel 2020). The project team, in consultation with the states, made consensus decisions regarding the modeling method for estimating economic contributions, the forest products sectors to include in analysis (either in total or in part), the IMPLAN year for reporting results, and the use of an analysis spreadsheet for consistent reporting.

The economic contributions of the region and each state's forest products industries relied on 2017 IMPLAN software and data. IMPLAN is a widely used economic IO model that focuses on interdependence among various producing and consuming sectors in the economy. IMPLAN has 536 industry sectors for the 2017 data set and is based on the NAICS. IMPLAN data are compiled and linked by the IMPLAN software (Version 3.1.1001.12); data come from various government agencies, including the U.S. Census Bureau, the U.S. Bureau of Labor Statistics, and the U.S. Bureau of Economic Analysis. Economic measures in IMPLAN include employment, labor income, value-added, output, and others. More detailed information on data sources is available at [the IMPLAN website](#).

Wassily Leontief developed IO modeling in the mid-20th century. Impact analysis examines the effects of changes in demand in a regional economy, while contribution analysis can evaluate the role of several related sectors in a region. IMPLAN provides the software and data to conduct such analyses. Each sector has a production function tracing the backward linkages (i.e., suppliers) to other sectors. Various sectors produce commodities (e.g., the logging sector produces logs). Leakages (e.g., foreign and domestic imports/exports) to and from other regions are also modeled. Social accounting flows among industries, households, government, and capital are included in IMPLAN.

The analysis process begins with creating an IMPLAN model. One or more geographic areas (e.g., counties or states) are selected as the region. Then, models are run through the creation of multipliers. This report uses Social Accounting Matrix (SAM) multipliers. Next, activities are selected to estimate either economic impacts or contributions. For example, analysts can estimate the impacts of expanding or contracting industries. In the case of contribution analysis, it is important to ensure that the level of production does not exceed the actual level of production in the region. Contribution analysis essentially counters the effects of the multipliers.

Contributions can be in terms of value-added, output, employment, and/or labor income. Value-added is commonly used to describe an industry's economic contributions and is a conservative measure of these contributions. Value-added is the difference between an industry's output, and the costs of intermediate inputs. When a sawmill sells a board, the value of the log and other inputs is not counted in value-added because they were counted when produced by loggers and others. Thus, only new additions to value (e.g., labor income) are included. Labor income is the major component of value-

added and includes employee compensation and proprietor income. Value-added, summed across all sectors, is equal to GSP.

Another measure of economic contribution is industry output. For example, if a log is sold to a sawmill that sells boards, both sales are counted as part of the overall region's output, as they are important economic activities. Another measure, employment, includes both full- and part-time jobs. As the number of sectors in an analysis increases, there can be overlap in the number of part-time jobs across sectors.

## Methods

IMPLAN estimates economic impacts (i.e., effects of economic changes) and contributions (i.e., effects of existing industries). Two methods for multisector economic contribution analysis are available (Parajuli et al., 2018), both requiring significant data manipulation.

The first method customizes the IMPLAN model by changing selected endogenous tables, whereas the second method adjusts input values based on matrix inversion prior to analysis. In method one, the changes are internal to IMPLAN and difficult to monitor from a quality control perspective.

Method two relies mostly on spreadsheet-based manipulation and is easier to monitor. When the contribution analysis is completed, direct effects from the IMPLAN sectors of interest equal the amounts shown in IMPLAN's "Industry Detail" table, and the total contributions (direct plus indirect plus induced) are estimated. Both methods prevent over reporting of total effects, which can occur if standard economic impact analysis is used when contribution analysis results are desired.

IMPLAN was designed for economic impact analysis. Multipliers ensure that the ripple effect manifests across the economy. A portion of those effects often involve self-purchases within the sector of interest. That is, if the output from the logging sector is \$1 million in a local economy, the economic impact of \$1 million in sales would be greater than that amount due to self-purchases. The contribution methods are designed to yield the \$1 million direct contribution and its associated effects. Put simply, the amount of sales (direct contribution) estimated cannot exceed the amount that actually exists. Methods one and two accomplish this.

The matrix inversion approach relies on developing a detailed social accounting matrix (SAM) output multipliers for each sector in the forest products industries. Hence, a 32x32 matrix is developed with the diagonal yielding a value close to 1.0 for the detailed multipliers relating each row-column sector to itself (e.g., logging to logging, sawmills to sawmills, etc.). The actual matrix can be developed in several ways. For example, the SAM matrix can be exported from IMPLAN and narrowed down to the appropriate row and columns for the forest products industries. Then, it can be used to develop detailed multipliers via matrix inversion. Alternatively, detailed multipliers can be exported and rearranged into a 32x32 matrix. The approach used in this report was to rely on a matrix developed by IMPLAN staff for

the state. Then, the matrix was inverted and multiplied the initial IMPLAN output values for forest industries sectors to yield inputs for IMPLAN analysis.

## Appendix B: Forest Products Industries Groupings and IMPLAN Sectors

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### Exhibit B1. Forestry Industry Grouping and IMPLAN Sectors

IMPLAN Sector	Sector Name
10	Maple syrup production*
15	Forestry, forest products, and timber tract production
19	Support activities for forestry*

Note: Sectors with an “\*” indicate that only a portion of the sector is included in the forest products industries.

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### Exhibit B2. Logging Industry Grouping and IMPLAN Sector

IMPLAN Sector	Sector Name
16	Commercial logging

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### Exhibit B3. Primary Solid Wood Products Industry Grouping and IMPLAN Sectors

IMPLAN Sector	Sector Name
47	Electric power generation—biomass*
134	Sawmills
135	Wood preservation
136	Veneer and plywood manufacturing
138	Reconstituted wood product manufacturing

Note: Sectors with an “\*” indicate that only a portion of the sector is included in the forest products industries.

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### Exhibit B4. Secondary Solid Wood Products Industry Grouping and IMPLAN Sectors

IMPLAN Sector	Sector Name
137	Engineered wood member and truss manufacturing
139	Wood windows and doors manufacturing
140	Cut stock, resawing lumber, and planing
141	Other millwork, including flooring
142	Wood container and pallet manufacturing
143	Manufactured home (mobile home) manufacturing

<b>IMPLAN Sector</b>	<b>Sector Name</b>
144	Prefabricated wood building manufacturing
145	All other miscellaneous wood product manufacturing

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**Exhibit B5. Wood Furniture Industry Grouping and IMPLAN Sectors**

<b>IMPLAN Sector</b>	<b>Sector Name</b>
368	Wood kitchen cabinet and countertop manufacturing
369	Upholstered household furniture manufacturing
370	Nonupholstered wood household furniture manufacturing
372	Institutional wood furniture manufacturing*
373	Wood office furniture manufacturing
374	Custom architectural woodwork and millwork manufacturing
376	Showcase, partition, shelving, and locker manufacturing*

Note: Sectors with an “\*” indicate that only a portion of the sector is included in the forest products industries.

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**Exhibit B6. Pulp, Paper, and Paperboard Mills Industry Grouping and IMPLAN Sectors**

<b>IMPLAN Sector</b>	<b>Sector Name</b>
146	Pulp mills
147	Paper mills
148	Paperboard mills

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**Exhibit B7. Secondary Paperboard and Other Paper Products Industry Grouping and IMPLAN Sectors**

<b>IMPLAN Sector</b>	<b>Sector Name</b>
149	Paperboard container manufacturing
150	Paper bag and coated and treated paper manufacturing
151	Stationery product manufacturing
152	Sanitary paper product manufacturing
153	All other converted paper product manufacturing

## Appendix C: Detailed Economic Contribution Results

### Direct Economic Contribution by IMPLAN Sector

**Exhibit C1.** Direct Economic Contributions, Forestry Detail, 2017

Sector	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Forestry, forest products, and timber tract production	-	-	-	-
Support activities for forestry	19	\$1,212	\$1,189	\$1,262
Maple syrup production	71	\$472	\$454	\$1,244
<b>Subtotal</b>	<b>90</b>	<b>\$1,683</b>	<b>\$1,642</b>	<b>\$2,506</b>

**Exhibit C2.** Direct Economic Contributions, Logging Detail, 2017

Sector	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Commercial logging	569	\$25,807	\$27,016	\$39,521
<b>Subtotal</b>	<b>569</b>	<b>\$25,807</b>	<b>\$27,016</b>	<b>\$39,521</b>

**Exhibit C3.** Direct Economic Contributions, Primary Solid Wood Products Detail, 2017

Sector	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Electric power generation—biomass	28	\$24,211	\$31,067	\$42,624
Sawmills	218	\$11,545	\$10,912	\$58,907
Wood preservation	30	\$2,134	\$731	\$15,049
Veneer and plywood manufacturing	-	-	-	-
Reconstituted wood product manufacturing	-	-	-	-
<b>Subtotal</b>	<b>276</b>	<b>\$37,889</b>	<b>\$42,710</b>	<b>\$116,580</b>

**Exhibit C4. Direct Economic Contributions, Secondary Solid Wood Products Detail, 2017**

<b>Sector</b>	<b>Employment</b>	<b>Labor Income (Thousands of Dollars)</b>	<b>Value-added (Thousands of Dollars)</b>	<b>Output (Thousands of Dollars)</b>
Engineered wood member and truss manufacturing	78	\$5,551	\$6,070	\$18,596
Wood windows and doors manufacturing	67	\$4,301	\$4,220	\$14,729
Cut stock, resawing lumber, and planing	14	\$744	\$680	\$2,972
Other millwork, including flooring	464	\$30,921	\$28,621	\$93,495
Wood container and pallet manufacturing	396	\$19,564	\$18,635	\$59,031
Manufactured home (mobile home) manufacturing	-	-	-	-
Prefabricated wood building manufacturing	84	\$4,753	\$4,602	\$14,131
All other miscellaneous wood product manufacturing	165	\$8,634	\$7,930	\$27,881
<b>Subtotal</b>	<b>1,268</b>	<b>\$74,468</b>	<b>\$70,756</b>	<b>\$230,835</b>

**Exhibit C5. Direct Economic Contributions, Wood Furniture Detail, 2017**

<b>Sector</b>	<b>Employment</b>	<b>Labor Income (Thousands of Dollars)</b>	<b>Value-added (Thousands of Dollars)</b>	<b>Output (Thousands of Dollars)</b>
Wood kitchen cabinet and countertop manufacturing	1,215	\$96,057	\$92,297	\$202,071
Upholstered household furniture manufacturing	78	\$5,871	\$5,322	\$16,202
Nonupholstered wood household furniture manufacturing	175	\$14,666	\$13,738	\$27,009
Institutional wood furniture manufacturing	54	\$3,824	\$3,583	\$10,442
Wood office furniture manufacturing	162	\$15,973	\$12,203	\$34,715
Custom architectural woodwork and millwork manufacturing	549	\$48,356	\$45,543	\$97,721
Showcase, partition, shelving, and locker manufacturing	303	\$24,974	\$21,566	\$62,779
<b>Subtotal</b>	<b>2,535</b>	<b>\$209,721</b>	<b>\$194,252</b>	<b>\$450,940</b>

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**Exhibit C6. Direct Economic Contributions, Pulp, Paper, and Paperboard Mills Detail, 2017**

<b>Sector</b>	<b>Employment</b>	<b>Labor Income (Thousands of Dollars)</b>	<b>Value-added (Thousands of Dollars)</b>	<b>Output (Thousands of Dollars)</b>
Pulp mills	-	-	-	-
Paper mills	685	\$70,746	\$99,723	\$499,923
Paperboard mills	143	\$15,290	\$20,185	\$111,080
<b>Subtotal</b>	<b>828</b>	<b>\$86,036</b>	<b>\$119,908</b>	<b>\$611,003</b>

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**Exhibit C7. Direct Economic Contributions, Secondary Paperboard and Other Paper Products Detail, 2017**

<b>Sector</b>	<b>Employment</b>	<b>Labor Income (Thousands of Dollars)</b>	<b>Value-added (Thousands of Dollars)</b>	<b>Output (Thousands of Dollars)</b>
Paperboard container manufacturing	1,179	\$91,327	\$111,721	\$538,679
Paper bag and coated and treated paper manufacturing	751	\$65,572	\$79,601	\$327,946
Stationery product manufacturing	61	\$3,055	\$3,737	\$20,253
Sanitary paper product manufacturing	56	\$6,247	\$10,053	\$39,399
All other converted paper product manufacturing	117	\$10,508	\$11,618	\$37,828
<b>Subtotal</b>	<b>2,164</b>	<b>\$176,709</b>	<b>\$216,730</b>	<b>\$964,105</b>

Note: Value-added in IMPLAN is equivalent to gross state product.

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